

### **REMARKS**

Claims 1-3 and 11-25 are all the claims presently pending in the application. Claims 4-10 are canceled. Claims 1-3 are amended to more clearly define the invention and claims 11-25 are added. Claims 1 and 25 are independent.

These amendments are made only to more particularly point out the invention for the Examiner and not for narrowing the scope of the claims or for any reason related to a statutory requirement for patentability.

Applicants also note that, notwithstanding any claim amendments herein or later during prosecution, Applicants' intent is to encompass equivalents of all claim elements.

Claims 1-2 stand rejected under 35 U.S.C. § 102(e) as being anticipated by the Takahashi et al. reference. Claim 3 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over the Takahashi et al. reference in view of the Lin et al. reference.

These rejections are respectfully traversed in the following discussion.

#### **I. THE CLAIMED INVENTION**

An exemplary embodiment of the claimed invention, as defined by, for example, independent claim 1, is directed to a light emitting diode that includes a package, and a plurality of light emitting elements that are electrically connected to a plurality of electrode plates provided in the package and that are sealed with transparent material. A red light emitting element of the plurality of light emitting elements is wire bonded along a longitudinal direction of the package. A green light emitting element and a blue light emitting element are flip-chip bonded face down directly to a first electrode of the plurality of electrodes. The plurality of electrodes extend to a surface opposite to a light emission surface of the light emitting diode lamp while being embedded in the package.

Conventional surface mount device package type light emitting diode lamps include light emitting diodes that are die bonded in an upper half region of a light emission surface and are wire bonded to leads in a lower half region. These conventional devices are limited

by this arrangement in the amount by which the height may be reduced.

In stark contrast, an exemplary embodiment of the present invention provides a green light emitting element and a blue light emitting element are flip-chip bonded face down directly to a first electrode of the plurality of electrodes. In this manner, the height of the package may be reduced because the opening in the package only needs to be large enough to receive the light emitting elements such that they do not contact each other and the lower half portion of the lamp may be omitted. (Page 5, lines 24- 28).

Further, flip-chip bonding the light emitting elements directly to an electrode obviates the necessity for wire bonding which further enables a reduction in the height of the lamp. (Page 5, line 29 – page 6, line 4).

## **II. THE PRIOR ART REJECTIONS**

### **A. The Takahashi et al. reference**

Regarding the rejection of claims 1-2, the Examiner alleges that the Takahashi et al. reference teaches the claimed invention. Applicants submit, however, that there are elements of the claimed invention which are neither taught nor suggested by the Takahashi et al. reference.

None of the applied references teaches or suggests the features of the claimed invention including a green light emitting element and a blue light emitting element that are flip-chip bonded face down directly to a first electrode of the plurality of electrodes. As explained above, this feature is important for reducing the height of the package because the opening in the package only needs to be large enough to receive the light emitting elements such that they do not contact each other, because the lower half of the conventional lamp is obviated, and also because the amount of wire bonding is reduced.

In stark contrast, the Takahashi et al. reference discloses a lamp which includes a plurality of light emitting elements that are each mounted upon a sub-mount which is a zener diode and that the zener diode is mounted on an underlying electrode. The Takahashi et al.

reference discloses flip-chip mounting some of the light emitting diodes to a zener diode and then interconnecting the zener diodes. These zener diodes serve to protect the light emitting elements from abrupt voltage changes. (Col. 4, lines 13 – 20).

Indeed, in stark contrast to the present invention, the Takahashi et al. reference very specifically teaches away from mounting the light emitting elements on a single lead to, among other things, improve heat sink performance. (See, for example, col. 3, lines 7-17).

Further, the lamp that is disclosed by the Takahashi et al. reference very clearly suffers from the problems which are solved by the present invention. The Takahashi et al. reference discloses a lamp which requires the use of wire bonding to connect the zener diodes. The presence of these wire bonds limits the amount by which the height of the lamp may be reduced.

The Takahashi et al. reference very clearly does not teach or suggest the features of the claimed invention including a green light emitting element and a blue light emitting element that are flip-chip bonded face down directly to a first electrode of the plurality of electrodes.

Therefore, the Takahashi et al. reference does not teach or suggest each and every element of the claimed invention and the Examiner is respectfully requested to withdraw this rejection of claims 1-2.

**B. The Takahashi et al. reference in view of the Lin et al. reference**

The Examiner alleges that the Lin et al. reference would have been combined with the Takahashi et al. reference to form the claimed invention. Applicants submit, however, that these references would not have been combined and even if combined, the combination would not teach or suggest each and every element of the claimed invention.

None of the applied references teaches or suggests the features of the claimed invention including a green light emitting element and a blue light emitting element that are flip-chip bonded face down directly to a first electrode of the plurality of electrodes. This

feature is important for reducing the height of the package because the opening in the package only needs to be large enough to receive the light emitting elements such that they do not contact each other, because the lower half of the conventional lamp is obviated, and also because the amount of wire bonding is reduced.

As explained above, the Takahashi et al. reference does not teach or suggest these features.

The Lin et al. reference does not remedy the deficiencies of the Takahashi et al. reference.

Indeed, the Examiner does not allege that the Lin et al. reference remedies these deficiencies.

Rather, the Lin et al. reference display device 50 that includes transparent conductive substrates 521, 522, and 523, on which light emitting elements 521, 522, and 523 are bonded and that the transparent conductive substrates 521, 522, and 523 are positioned on a base 51 such that the light emitting elements 521, 522, and 523 extend into openings 551, 552, and 553.

The Lin et al. reference does not teach or suggest any light emitting elements being flip-chip bonded onto a first electrode at all. Rather, and in stark contrast, the Lin et al reference discloses wire bonding the light emitting elements to electrodes.

Clearly, the Lin et al. reference does not teach or suggest the features of the claimed invention including a green light emitting element and a blue light emitting element that are flip-chip bonded face down directly to a first electrode of the plurality of electrodes.

Moreover, Applicants submit that these references would not have been combined as alleged by the Examiner. Indeed, the references are directed to completely different matters and problems.

In particular, the Takahashi et al. reference is concerned with providing a lamp which can be miniaturized and is superior in heatsinking performance and intensity by diminishing

the number of interconnecting wires. (Col. 2, lines 47 – 52).

In stark contrast, the Lin et al. reference is concerned with providing a full color display that can increase the light emitting efficiency and prevent the light emitting element from being damaged by a coating resin. (Col. 3, lines 11 – 17).

One of ordinary skill in the art who was concerned with providing a lamp which can be miniaturized and is superior in heatsinking performance and intensity by diminishing the number of interconnecting wires as the Takahashi et al. reference is concerned would not have referred to the Lin et al. reference, and vice-versa, because the Lin et al. reference is concerned with the completely different and unrelated problem of providing a full color display that can increase the light emitting efficiency and prevent the light emitting element from being damaged by a coating resin. Thus, these references would not have been combined.

Therefore, the Examiner is respectfully requested to withdraw the rejection of claim 3.

### **III. FORMAL MATTERS AND CONCLUSION**

The Office Action objects to the drawings. This Amendment amends independent claim 1 to clarify that the plurality of electrodes extend to a surface opposite to a light emission surface of the light emitting diode lamp while being embedded in the package. Applicants respectfully submit that these features are clearly illustrated by, for example, Figures 7 and 8. Figures 7 and 8 illustrate a plurality of electrodes 104A – 104G, that are embedded in the package, and that extend through through-holes 107a to portions 170 – 175 which are on a surface opposite to a light emission surface. Applicants respectfully request withdrawal of this objection.

In view of the foregoing amendments and remarks, Applicant respectfully submits

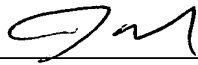
that claims 1-25, all the claims presently pending in the Application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the Application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

Date: 8/7/04

  
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